Course Policy:

Department	Information Technology
Faculty	Computer Science
Course Code	BIT-481
Course Title	Cloud computing
Credit hour	3
Pre-Requisite	Data Comm and Computer Networking
Course Instructor	Baitullah Malakhil
Text Book	1. Cloud Computing Principals and Paradigms 2. Essentials of cloud computing (2015)
Reference Book	1. Cloud Computing Principals and Paradigms 2. Essentials of cloud computing (2015)

1. Course Description:

The Cloud Computing course cover the main concepts, terminologies, network & security deployment mechanisms, virtualizations, hypervisors and types of cloud computing. The idea is to equip the students with the knowledge of the cloud computing and enable them to build a sample cloud computing environment using their own laptops. The private and public cloud along with the most famous Cloud Service Providers (CSP) will also be described in details.

2. Course Learning Objectives (CLO):

1. Understanding the concept, demand and importance of cloud computing
2. Understanding the NIST definition, deployment and service models of cloud computing
3. Knowledge of cloud characteristics
4. Models for migration into cloud computing
5. Knowing cloud services offered by different cloud service providers
6. Understanding cloud computing security concerns
7. Software for creating private or public cloud

3. Learning Domain:

Course Policy:

- Cognitive (knowledge)
- Affective (Attitude)
- Psychomotor (Physical or Manual skills)

  Only cognitive domain is used for this course while the rest two cannot applied here

4. Course Learning Objectives Mapping with Bloom Taxonomy:

1) Remembering
2) Understanding
3) Applying
4) Analyzing
5) Evaluating
6) Creating

COLs	1	2	3	4	5	6
CLO1	True	True		True		
CLO2		True		True		
CLO3	True	True		True		
CLO4	True	True		True		
CLO5		True		True		
CLO6	True	True		True		
CLO7		True		True		
CLO8	True	True		True		

5. Course Teaching Methods

Course Policy:

1	Lecture
2	Problem solving Learning
3	Interactive Learning
4	Practical sessions

6. Grading Scheme

Mid Term	20%
Assignments	10%
Quiz	10%
Final Term	60%

7. **Weekly Course Breakdown:**

Course Policy:

Class (50 mins)	Week #	Topic	Learning outcome	Instructor Activity	Student Activity	Assessment
1	1	**Chapter 1 – Computing paradigm** - High-Performance Computing - Parallel Computing	- At the end of the class the students will be able to relate the course with other pre-requisites. - The students will be able to familiarize with course contents. - The importance and applications of the course	- AO: What the students think about Cloud computing? - How does cloud reduce IT costs? - PPT presentation lecture - Close: what will the student be able to do after successfully completion of the course?	- Discussion - listening the lecture - Brain storming - Note taking	-Q&A - feedback
2		- Distributed Computing - Cluster Computing - Grid Computing - Cloud Computing	- A brief history of the cloud computing - Understanding Grid, parallel and distributed network	- AO: delivering the main concepts - ID: Lecture presentation - Close: summarizing the lecture	-Brain storming -Listening to the lecture -Note taking - one end question	- feedback - Q&A - Reflection. - Summative: 1Q for final exam.
1	2	**Chapter 2 CC Fundamentals** - The Need for Cloud Computing - Defining Cloud Computing - NIST Definition of Cloud Computing	- Understanding NIST definition and characteristics of cloud computing	- AO: NIST definition of cloud - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - Note taking - one end question	- feedback - asking 1-5 questions randomly - reflection - Assignment
2		- Cloud Computing Is a Service - Cloud Computing Is a Platform - Principles of Cloud	- Understanding three main service model of the cloud computing	- AO-Asking the students about the previous topic. - Lecture presentation - close: summarizing	- Brain storming - Listening to the lecture - Note taking - one end question	-reflection -peer rating -Assignment -HW

Course Policy:

		computing		the lecture		
1	3	**Chapter 2 Cloud Computing Fundamentals:** - Five Essential Characteristics - Four Cloud Deployment Models	- At the end of the class the students will be able to: - Explain the essential characteristics of cloud computing as defined by NIST - Understanding the cloud computing deployment models	- AO-Asking the students about the previous topic. - Lecture presentation - close: summarizing the lecture	- think pair share - Discussion - listening the lecture - understanding the lecture - Taking short notes	- Feedback - Reflection - Assignment - Summative: - -Final exam question.
2		- Three Service Offering Models - Requirements for Cloud Services - Cloud Application	- At the end of the class the students will be able to explain: - The IaaS, PaaS and SaaS - Requirements and applications of cloud computing	- AO: asking questions randomly - ID-PPT presentation lecture - Close: list what you have learn in this class	- think pair share - Discussion - listening the lecture - taking short notes	- Feedback - Reflection - Assignment - Summative: - -Final exam question.
1	4	**Chapter 3 – Cloud Computing Architecture and Management** - Cloud Architecture - Layer 1 (User/Client Layer) - Layer 2 (Network Layer)	- At the end of this course the Students will be able to: - Understand the cloud architecture and its layers	- AO: asking questions randomly - ID-PPT presentation lecture - Close: list what you have learn in this class	- think pair share - Discussion - listening the lecture - taking short notes	- Feedback - Reflection - Assignment - Summative: - Final exam question.
2		- Layer 3 (Cloud Management Layer) - Layer 4 (Hardware Resource Layer)	- At the end of this course the Students will be able to: - Understand the layers of cloud architecture (L3 and L4)	- AO: asking questions randomly - ID-PPT presentation lecture - Close: list what you have learn in this class	- think pair share - Discussion - listening the lecture - understanding the lecture - Taking short notes	- Feedback - Reflection - Assignment - Summative: - -Lab report

Course Policy:

1	**5**	**Chapter 3 (continued):** - Migrating Application to Cloud - Approaches for Cloud Migration -	- Understanding the migration approaches into cloud -	- AO: what is migration? Which approach is better than the other? - ID-PPT presentation lecture - Close: list what you have learn in this class? -	- think pair share - Discussion - listening the lecture - taking short notes	- Feedback - Reflection - Assignment - Summative: - Final exam questions
2		- Seven step iterative migration model -	- Understanding the risk of migration - Understanding Seven steps iterative migration model -	- AO: asking random questions - ID-PPT presentation lecture - Close: list what you have learn in this class?	- think pair share - Discussion - listening the lecture - taking short notes Listening to lecture	- Feedback - Reflection - Assignment - Summative: - HW
1	**6**	**Chapter 4 Cloud Deployment Models** - Introduction - Private Cloud - On-Premise Private Cloud - Outsourced Private Cloud	- Understanding the deployment of cloud - Understanding private cloud	- AO: which deployment model suits which environment? - Lecture presentation - close: summarizing the lecture	- think pair share - Discussion - listening the lecture - taking notes	- Feedback - Reflection - Assignment - Summative: - Final exam questions - Summative: HW
2		- Public cloud - Hybrid cloud - Community cloud	- Understanding Public, hybrid and community cloud and their suitable environments	- AO: asking questions randomly - Lecture presentation - close: summarizing the lecture	- think pair share - Discussion - listening the lecture - taking short notes Listening to lecture	- Feedback - Reflection - Assignment - Summative: - -Lab report
1	**7**	**Chapter 5 – Cloud Service**	- At the end of the class the students will be able	- Asking opening class 1-5 question by	- Brain storming - Listening to the	- Feedback - Reflection

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		Models. - Introduction - Infrastructure as a Service - Platform as a Service - Software as a Service	to explain: - The IaaS, PaaS and SaaS -	random selection - Lecture presentation - close: summarizing the lecture	lecture - note taking - Performing the assignment	- Assignment - Summative: - Final exam questions - Summative: HW
2		- Virtualization - Approaches in Virtualization - Server, Processor, RAM, Storage and Network virtualization	- Understanding the virtualization concept - History of virtualization - Virtualization of hardware resources - Virtualization approaches	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- Feedback - Reflection - Assignment - Summative: - -Lab report
1	**8**	- Types of virtualization - Full Virtualization - Para virtualization - Hardware based virt	- Understanding different types of virtualization	- Asking opening class 1-5 question by random - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking	- feedback - Assignment - Reflection. - Formative: 1-5 question random selection
2		- Hypervisor and Its Role - Types of Virtualization - OS Virtualization - Server Virtualization	- Understanding the hypervisor and its types - Understanding OS and Server virtualization with examples	- Asking opening class 1-5 question by random - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking	- Feedback - Reflection - Assignment - Summative: - -Lab report
1	**9**	- Memory Virtualization - Storage Virtualization - Application Virtualization	- Understanding memory, storage and application virtualization with real life examples	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- feedback - Assignment - Reflection. - Formative: 1-5 question random selection - HW
2		- Network Virtualization - Traditional networks	- Understanding the history and phases of the development of network	- Asking opening class 1-5 question by	- Brain storming - Listening to the	- Feedback - Reflection

Course Policy:

		without virtualization - Network virtualization using VLAN - Programmable network virtualization	virtualization	random selection - Lecture presentation - close: summarizing the lecture	lecture - note taking - Performing the assignment	- Assignment - Summative: - HW
1	**1 0**	**Chapter 10 – Networking for Cloud Computing** - Introduction - Overview of Data Center Environment	- Understanding Data Center Networking DCN -	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- feedback - Assignment - Reflection. - Formative: 1-5 question random selection - Summative: 1Q for final exam
2		- Architecture of Classical Data Centers - Storage and Networking Infrastructure - Networking Issues in Data Centers	- Understanding Architecture of traditional DC - Understanding of storage and networking infrastructure at DC - Networking issues at DC	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- sharing problems - discussion - Taking short notes - Listening to the lecture	- Feedback - Reflection - Assignment - Summative: - -HW
1	**1 1**	- Transport Layer Issues in DCNs - TCP Impairments in DCNs - TCP Incast - TCP Outcast - Queue Buildup - Buffer Pressure - Frames tagging -	- Understanding the main problems at DCN - Understanding TCP implementation in the DCN	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture -	- Brain storming - Listening to the lecture - note taking - Performing the assignment -	- feedback - Assignment - Reflection. - Formative: HW
		- TCP Enhancements for DCNs - TCP with Fine-Grained RTO (FG-	- Understanding the integration of TCP with other technologies in the	- Asking opening class 1-5 question by random selection	- Brain storming - Listening to the lecture	- feedback - Assignment - Reflection.

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2		RTO - TCP with FG-RTO + Delayed ACKs Disabled	DCN	- Lecture presentation - close: summarizing the lecture	- note taking - Performing the assignment -	- Formative: HW
1	**12**	- Chapter 11 – Cloud Service Providers - Google Cloud Platform Cloud Storage Google Cloud Connect Google Cloud Print Google App Engine - Amazon Web Services Amazon Elastic Compute Cloud Amazon Simple Storage Service Amazon Simple Queue Service	- Gaining information about different CSPs including Google and Amazon	- Asking opening class 1-5 question - Lecture presentation - close: summarizing the lecture -	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- feedback - Assignment - Reflection. - Formative: HW
2		- Microsoft Windows Azure - IBM Cloud Models - IBM SmartCloud - Salesforce **-** Rackspace	- Learning about IBM, Windows Azure and other CSPs.	- AO: lab agenda and objectives - Lecture presentation - Close: assisting students with lab work	- Hands on practice - Implementation of the previous lesson - Taking short notes	- Feedback - Reflection - Assignment - Summative: - HW
1	**13**	**Chapter 12 Security in Cloud Computing** - Cloud General Challenges - Security Aspects - Data Security - Access Control	- Understanding the security issues and vulnerabilities in the cloud computing - Understanding data and network security concerns	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment -	- feedback - Assignment - Reflection. - Formative: 1-5 question random selection - Summative: HW
2		- Encryption and Decryption	- Understanding the security in virtualization,	- Asking opening class 1-5 question by	- Brain storming - Listening to the	- Feedback - Reflection

Course Policy:

		- Symmetric and asymmetric encryptions - Virtualization Security - Network Security	and the types of encryption and decryption for data security	random selection - Lecture presentation - close: summarizing the lecture	lecture - note taking - Performing the assignment -	- Assignment - Summative: - HW
1	**14**	Chapter 12: - Security concerns in the cloud computing service models - Software-as-a-Service Security Issues -	- Understanding the security risks in the cloud computing service models -	- Asking opening class 1-5 questions - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- feedback - Assignment - Reflection. - Summative: HW
2		- Infrastructure-as-a-Service Security Issues - Platform-as-a-Service Security Issues	- Understanding the security vulnerabilities of IaaS and PaaS	- Asking opening class 1-5 questions - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- Feedback - Reflection - Assignment - Summative: - HW
1	**15**	- Clustering - Purpose of Clustering - Cluster components - Major type of cluster - Storage - High availability - Load balancing - High performance	- Understanding the concept of clustering in the cloud computing and the main types of the clustering	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- Assignment - Reflection. - Formative: 1-5 question random selection - Summative: 1Q for final exam
2		- Clustering functionality - Cluster share volumes	- Knowing the concept of functionality clustering and share volume clustering	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- Feedback - Reflection - Assignment - Summative: - HW

Course Policy:

1	**16**	- Creating a private cloud - Requirements -	- Understanding the requirements of creating a private cloud computing environment	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Listening to the lecture - Rising up questions - Taking note of the answers	- Assignment - Reflection. - Formative: 1-5 question random selection - Summative: 1Q for final exam
2		- Cloud computing creating software - Microsoft Azzure - CloudStack - OpenStack	- Creating a private cloud in a laptop using the cloud creating software	- Asking opening class 1-5 question by random selection - Lecture presentation - close: summarizing the lecture	- Brain storming - Listening to the lecture - note taking - Performing the assignment	- Assignment - Reflection. - Formative: 1-5 question random selection - Summative: 1Q for final exam